Notebook, N-00-08-21

This notebook is a continuation of N-00-01-23. It was used during August 1900. The book contains notes by Edison regarding the use of copper, zinc, or nickel in storage batteries. Near the end of the book is a one-page entry by an unidentified experimenter relating to iron ore separation. The front cover is labeled "Started Aug 21st 1900 (2)." The pages are unnumbered. Approximately 130 pages have been used.

August 21 1900

Experiments on Storage Battery
Continued from the other books

It looks as if towards the end of oxidizing of the material of a grid, & it is going lowering the current density stops going & it goes on oxidizing the. Is the reason why some Coppers show higher or lower efficiency — to get at the real efficiency compare current density above be low say 1/2 amp for every inch free exposed when in pocket — for instance No 23 was going freely for .15 amp but when I reduced current to .10 amp the going stopped and we gave cable off for 15 minutes showing there was still Copper to be oxidized —

No 27 = Blue hydrate from Sulph Cop-
pp by Soda - Washed by decantation
found it black in the morning -
then squeezed & got all water could
out - then worked it in alcohol -
filtered - & then dried in the
plate by flow - worked it up ~~to~~
~~putting the~~ rather dry but not perfectly
dry - used originally 40 grms
Sulph Cop - then added to
same dry hydrate 5 grms nitrate
silver in very small granules
water - then worked in mortar
till stiff - filled 4 wide grids
packed & pressed - Reduced by
Hydrogen in tube with heat,
It shrunk so pieces loose in
pockets most silver came out
on surface - beautifull Copper
color & clean - I leave them
loose in grid weight each
grid .52 gram total 2.08
gram - On oxidizing at
5.40 pm .10 amp -
at 7.37 put current to .15
.20 amp here at 7.46 at 8.40 .35 amp here

25: Spoon electrode with 2 pieces
Same material as in 27. .10
amp — in exog at 552 pm —
Weight of pieces 2.85 grammes —
at 737 pm. put current to .15

24 + 25 Transferred from last Book 22 aug 1908

24 = found it gassing from Reducer it was gassing full amount — The grid which has heretofore been bright through all changes now shows not cuppry as usual but Velvety black all over — Contrary what this is Solution has no tint whatsoever at 9 am put it on dg .10 amp — 9.10 am .15 = .5 Current off 12 noon

Note = The grid had been gassing with Hydrogen for long time before I arrived evidently after one hour the Velvety black had turned to yellow of the same color as rust on nickel grids — in water — at end 3 hours the grids are nearly bright except the 3 lap pockets which are still somewhat yellow — Is this nickel dissolved in solution ~~[illegible]~~ ? what is it This would not be serious even if it was nickel as this probably due to over extension of nickel in Copper which should not occur in practice If Ni was partially in Cop as a hydrate I think it all reduced now + this action may not occur again

Current on at 1.55 pm

at 1 30 pm yellow deposition grid
nearly disappeared 2 pm yellow
Color on grid gone, there is a reddish
faint tint on sides of grid –
Solution seems slightly tinted but
hard to tell.
No black fluff dropped off
that pole.
2 pm .16 amp hour
at 2 13 pm stopped gassing
slightly – density too high at lower
density it would have gone much
longer – gassing about 10% –
2.30 pm grid [illegible] not increased above
10% = .68 amp hour –
at 2.35 gassing 20% .70 amp
hour – I reversed to Reducing
at 2.35 pm – When I reversed
very smoke amount black fluff
dropped off flat rear –
Cell has a slight blue tint
Grid bright & clean –
(at 6.30 not gassing when returned
from Supper Time gassing 7.40 pm –
Reversed to Oxidizing .15

No 25. Found it gassing about 1/4 to 1/3 of
what it showed be – It was oxidizing
grid clean solution very slightly tinted blue
Reversed put Reducing at 9 am – .10 –
9.10 am .15.5 Current off at noon
no change of color on this grid probably
because not hydrogenizing strong or long
enough or because not so much nickel
in Copper – Current on at 12.55 pm –
Whole solution has been tinted some for
a long time – Black fluff dropped
off flat pole – 2 pm has .6 amp hour
2.15 pm grid turning black
2.20 gassing slightly – I noticed gas
started leaving Cup out pocket look
grid out & lapped it & put back
but it started gassing Reversed to
Oxidizing at 2.22 pm. .65 amp hour
[illegible] powder like 24 is not gassing
be practicable but pieces like 24
will be a solid piece will be better –
gassing 6.20 pm .60 amp –
Reversed to Reducing 6.25 pm –

Record of little moulded Copper plates — The Copper is precipitated by Zinc from the Sulphate — Washed with Common water a little then squeezed & water displaced by Alcohol & then dried —

No 1. plates; liquid medium Nickel added very sparingly — Stiff dough moulded fine — on baking in dish over oil bath heat when heat came on was strong after baking — its family above — before baking — moulds fine & hand free good — practical after Reduction, rather [illegible] on coloured pieces — Copper test Cassia — Ng

No 2 Is acetate of nickel but weaker being the liquid left on top of lot of crystals originally out — a very little make stiff dough — too wet — I tried to dry front of fan but didn't dry very much plate rather friable to handle — Had to press this plate stronger to make it hold together. Can't say yet we can handle it or get it through the reduction tube.

Redog by H = Has N' Color

No 3 is nitrate of Copper not syrupy - a very little wets Cop & I think it will go hard to mould - No 3 was too wet, plates too friable to handle - put stuff in a 3" Evap. dish & set it first pan -

No 4. So nitrate of nickel, it seems to be thin, not syrupy, a very little with stiff, probably too hard to handle. Too wet put it in 3" Evap dish set at front of fan –

No 5 gs. solid ~~[illegible]~~ acetate Nickel
from the syrup fuel used having
solidified - Its apparently not
crystalline or acts like a hydrate.
Does not to Cop Cons. dissolve but
guess it would be ok
J = Comes out ok but brittle, Ni only
impurities, Cop too Coarse

No 6 is same as No 5 only I
used more of chrysoidi acetate No 1
Friday = plate went to pieces
No 7 =

No 7 Copper Acetate not syrupy rather thin but up to crystallizing point, put in dish & pail 5 days. Pan ~~=~~ ~~pb~~ Redog - plate bottle ng

No 8 (Copper Sulphate, Solution)
too thin I put in a drop more before
fan —

No 9 = Used Large quantity of nitrate Nickel = its quite stiring = when I poured it on Copper it hooked it together, but it broke up in water it will brick all right wet as it is after making absorbed moisture & all went to Mush — Make them over again & dry them as fast as made —

Nos 1 to 9 inclusive were made with course unfloated Copper following Nos made with Cop prepared by Zinc & floated off then alcoholized —

No 10 Is a lot of plates made from the floated Copper alcoholed - & heavy drips but still damp. It takes together good - There is nothing put with it = I am going to use these plates after reduction to soak various nickel salts in also plate by Council Tlc
= Came out Redeg OK but not strong enough to hard Pep must have some Copper alt to lock together or must have higher heat.
Came out from Redeg OK.

In redwithan pan 1st No 1
2nd No 7, 3rd No 8 4th No 10
5th No 15 —

Q. Remark that Nickel Cop
grid & Zinc gives 76 Volts
Potently there is more Chem
Reaction delaud was due to
fine division of Copper
probably —

No 11 fine float Cop —
Hot Cook sal Nitrate Nickel
used considerable — Each plate
as moulded is fired by heat
on a nickel plate set on
2 butter dishes above an
Sand bath —
Redeg by H — Came out Ni color
good — but minute Cracks +,
Some plates swelled from drying
too quick + too high temp

No 12 fine Cop Nitrate Cop
for dipping a gun

No 13 Zinc Cop-Sulph
Nickel —
Redcd by H = Came out nearly
Ni color.

14 = Black Ox. previously given hypnot
but burnt) black wax weight, washed,
alcoholed, dried, = Considerable quantity
Sulphuric acid stiff paste =
Contrary from mouth t –

15 - No 10 dipped in Nitrate Mercur
& dried in Water Bath

16 - No 10 dipped - Sulphate
Nickel & dried in water Bath -

Plates.

Start Fresh. 23rd august 1900

No 11 Cell

Is the plate made as per
No 11 – 915 Cracked in places
due to heating too quick + high
should be baked in Water Bath
Very slowly. They are not
straight + some warped –
broke in putting in pocket.
On Reducg .15 11 27 am –
growing in 2 minutes
Reversed to Oxdg at 11 35 am
Current off 12 noon till 1 pm
~~notice some blue appearing on~~
~~top of plate & smoking down~~
growing 315 – I will let it go
a little – Reversed to Reducg
3 30 pm – .40 amp hour –
growing 1/2 hour Reversed to Oxdg
1 st 630 pm, growing 1020
Reversed to Reducg 1025 pm
Current off for night 1230 am
on 9 35 am Reversed 11 am –

Made old 24 put on Reducing
at 355 pm —
gassing 9 30. pm
Reversed 10 pm .38 1235 off for
on at 935 am — at 1135 am .68 amp
Reversed to Reducing 135 — it was
[illegible]
at 2 pm .20

Phenomenon when agred
blackens by over hydrogenizing
it goes bright by Oxdn
so let Ur[illegible] stuff is dissolved
off — but it doesn't seem to hurt
[illegible] solution, must be lead?
35 3

No 13 Cell plate same as 13 —
Rather alright. + OK —
Reduced .15 at 1127 am
Started gassing — 3 minutes
Reversed to Oxdg at 1135 AM —
Current off 12 noon till 1 pm
.52 amp up to 4 o'clock
Silver tint (slight) at 4 pm —
.67 at 5 o'clock bubbs the been
gassing 25 @ 33 a/s for an hour
Still tinted slightly
Reversed to reducing 610 pm —
gas 1030 Reversed to Oxdg 1030 pm
Current off for night 1230 AM
on 935 am Revsd 11 am

No 2 Cell – Some broken not full – projects – Same as No 2

Redeg .15 at 11.27 AM
gased in 1 minute Revod to 0x8q
11.33 AM –
The plates stick up out of pocket = Blue is given off strongly
Current off 12 noon till 1 pm
as the blue stopped quickly & sank to bottom cell + no more apparently came out I changed cell for fresh solution
This blue is undoubtedly due to fact that the Copper of No 2 is Coarse & was not plated like 11 & 13 –
gassing at 2.35 .37 very heavy
Reversed to reducing at 2.38 pm –
gassing full ½ at 4.20 I left it
gas but 0x10 at 4.37 pm
bringing 3/4 hour Reversed to Reducing 5.45 pm – Again quite blue
Current off for night 12.30 AM
on 9.35 am Revod 11 am

20 – plate from No 10 – Reduced in Hydrogen – then dipped in Chloride Nickel once – dried in our bath, then reduced in H – not much nickel color – plate good – strong just fit pocket Spring & forced them down Reduced & allowed gas for several minutes

On Oxdg 7.05 pm – gas less bubbles on grid & plate than 21 – growing 1.30 –

~~Reduced & Pumped~~ 10 pm

growing little at 10.25 pm

Restored Cathode in

Current off for night 12.30 AM on 9.35 am. Rev'd 11 am

21 Sulphate Nickel
two dips — used a No 10 previously
reduced by it =
Redug allowing yers reversal much
On Oxdg 7.05 pm
This has upset subbles on good +
plate yesterday 12 hours
Reversed & reduing at 10 pm
gassing well 11.20 pm
Reversed at 11.20 to Oxdg
Ng

22 Nitrate Nickel 2nd dip
used Reduced by H No 10 —
Reducing - allowed gas several minutes
On Oxd 39 7 05 pm
Notice while little plate in pocket
front bubbles on while 20 & 21 have
notice little gas on grids or
anywhere here
Degassing at 1030 Reversed to
Reducing 1030. gassing 12 night
7
getting worse Either too
much nickel covering Copper
or its too dense —
Cannot off for night 1230 am —
On at 935 am Reversed 11 am

23 = Small size plate plated
a little with nickel by
Current - only seems to be if
wants an oxide
Only 2 plates in grid
.15 low at 1147 pm
Oxide = .155
Each plate weighs 350 milligrams
Making for the 2 plate 700 "
should give .625 amp hours
~~1130~~ 1230 giving -
No -
Reversed Reforming 1230 AM
Current off 1230 am on at 935 AM
Reversed 11 am -

Current off 1230 am

25 is [illegible] alcoholic.
then mixed with acetate Nickel.
Solution & Evaporated by stirring
down to Dryness — then powdered
somewhat & reduced by Hydrogen
By mistake 1st part used HCl on
Zinc, but towards least H_2SO_4 —
This is the one having most
nickel — On 0-Dg | 1.25 pm
Very large bubbles 1/8 dia appear
and of stuff in pocket This
never occurred before — No 26
don't have any — at 2 pm .20
.26 amp hour gone
Reversed Pole of 2.45 pm .20

26 is same as 25 with less Nickel
its darker & I think is not
redwood gold — The 3rd one I
don't like — We do not get
heat enough. Ott is making a
small brass tube to take
place big iron on.
On 0.09 1.25 pm - 2 pm .20
.26 amphibol gaining
Received Friday 24 pm .20

27 – Cu Nitrate swap to dryness
then added Hg 1 plate – 4 10 pm 1.10
at 4.35 was going little past it
at .067 Current going slightly
Reversed today at 4.40 pm .027
gas 100 1/2 at 5.25, 1 pm
Reversed 5.30 .07

Off 32
Rel 32
7 days 30

.75

30 – No 10 Reduced ~~Rel heat no steam~~ then dipped in Rising Sulphate Ni (nature of this process) Fired in Water room a reduced at red heat so no steam left
On O Rdg 6.50 pm 0.75

Weight of plate not nickled
.37 grammes

2 plates .74 of grammes obtained gave
.615 ampere hours

Raised Current to .10
at 7.50 pm

Losing 8 pm Reversed –
Off put opening on plate –
When fully reduced Reversed –
O Rdg at 8.56 pm
losing slightly 10.35 16.6 amph
Reversed 10.50 – .10

Current off 12.15 am
on .10 9.55 am
Reversed O Rdg at 10 am .10
Rev Rdg 12 noon .10

OVER

after being on .03 overn
Reduced Ox Dg — Reversed to
Redcg 10 am .084

66

39

No 31 Same as 30 only only put
in in water
On Ox Dg 650 .075
Raised Current to .10 750
gassing 8 am reversed
Reduced cell put springs on
Reversed to Ox Dg at 856 pm
gassing slightly at 1035
.1616 amp hours
Reversed 1050 pm .10 —

Current off 1215 am.
on 9 55 am .10
Reversed Ox Dg 10 am .10
Reversed 12 noon .10

Redg 10 am 084

7.5

17.5
6.4
24

16

"3% Red dipped Che Ni Strong
on Oxdz 650 pm - .075
Reversed Current to .10 750 pm
giving ~~Strong plating~~
washing to be reversed in bath
otherwise as above
~~Red Current to .075 [illegible]~~
gassing nearly full — 930
am going let it gas in whole
.24 amp hours

Reversed 10 pm .10 Redcy
1150 gassing 13% —
.18 amp hour
Reversed Oxdy 1155 .10

Notice no Copper deposited on
grid
Current off 1215 am

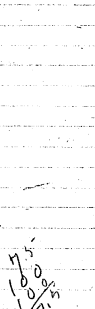
On 955 am .10
gassing 1135 — .22 amp hour
Reversed noon .10 - Redcy
Redcy 10 am .084

33 Chl N. in a No 10 weak
on 0xdg 6 50 pm 075
Raised Current to .10 at 7 00 pm
~~Raised Current to .15 at 9 pm~~
gassing nearly full 9 30 pm
gassing let it gas awhile —
.24 amp hours.

Reversed 10 pm .10 Redeg
gassing 10 °/d — .18 amp hour

~~Reversed~~ Reversed 0xdg 11 55
.10
Notice no Copper deposited on
grids

Current off 12 15 am
on 9 55 am .10
gassing 11 30 am
.22 amp hour
Reversed now Redeg .10
Redeg — 10 cm .084



34 = a plain No 10 good reduced
on Oxd 6.50 pm .075
Raised Current .10 at 7.50 pm
~~Raised Current to .15 at 8 pm~~
growing 10% 9.40 – .25 amp
powders of Cu_2O .308 is
theoretical + plate looks
Brown not black although density
thick at corners 20 .27
Reversed Oxd 10 pm .10

Notice considerable Copper or
something like it deposited
on grid. It may not be Cop
but think it is – This is
different on nickel plate
that brings no Copper at least
this deposit –
There seems to be a green
tint to cell but it about
same on 30 31 32 33.
may be an opalescence from
precips from Plat pack on
Reversing
12 mgt 2% growing .20 amp
Reversed Oxd – .10
Current off 12.15 am
on 9.55 am .10 over

75
100
100
75
2
37
47
57

In morning seems to have no tint at all - none on 30 31 32 + 33, going 1130 am 120 amp hour
Referred 11.51 am to Redag

Redag 10 am 084

35 - powder - acetate Ni reduced good at red heat on oxide (72.67) - going [illegible] reduced from [illegible] 1/30

35 - a single Red by H red hot No 10 secured in a clip.

-10 - 11.18 pm -

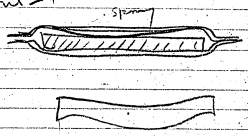
Notice it oxdys to Cu_2O.

after it starts growing oxds then to CuO - broke piece found black stuff all through but none on when only oxdys to Cu_2O =
Evidently. If copper is pure & free from [illegible] & has been fully reduced by H at red heat pretty well oxdys to Cu_2O. 60 @ 80%. Efficiency of attempt to go to CuO dull from Hydrate dol in NaOH

I noticed also in broken plate end on in Micro that while most all is CuO_2 to Cu_2O there were a large number of large pieces which were not CuO_2 hence necessity of having Copper very fine & porous.

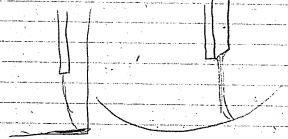
~~[illegible]~~ Aug 24 1900 Tuesday

Have just found out that the little plated lamp in the pocket gets out of Carbide a gas long before they should, by putting a little pocket spring in to force plate against inside of pocket it stops giving a good light. Evidently this dust of Carbide has been the cause of a large part of our troubles, Especially with powders & Hence here after notice must be taken of this & all pieces must have pressure this will go to be no drag in a Commercial Storage for Automobs — However I guess can solve it only it drains the agony out —



$$\begin{array}{r|l} 33 & 110 \\ & 99 \\ & 11 \end{array} \quad \begin{array}{r} 3.3 \\ 14.3 \end{array}$$

36 = one small plate in clip
on Oxdg at 9.55 am .10 3/4 amp
at 1/2 hour blue goes out of plate [illegible]
white & runs down sides both sides
& keeps with .005 of surface and
drops off at bottom



Current is .110 amp
going at 11.24 am – .110 amp
Reversed to Reduce 11.19 am –
.143 amp-hour
about 50% effency as Cu_2O
Changed Oxdg 1.45 pm
Reduce 10 am .088f
Reversed Oxdg 2 pm
gave 31p .088 amp hour

37 = Reg 10 - 1125 am .110
Nickel plated till dark
looks ok under microscope.
Revised Redcy 1 45 pm .10
Gassing 2 52 pm
Reversed Redcy 3 pm —

Monday OxDg2 some plates by heat
reduce in Cell also reduce some
by heat =
make a lot of 50 10 - also lot
50 10 not pressed go hard & some
pressed harder —
Make some Carbonate Cu plates
make some plates from Cu from
Zinc dust —
Freddy make dog clips
Silver some plates.

Redcy 10 am 08f
Rev OxDg 2 pm
Gassing .088 amp hr

38 - one of the dropped unlabeled plates
11 25 am - .110

gassing 12 noon .06 plates now getting black = great deal blue stream down and going to let it gas for 1/2 hour after 1 pm —
Rev Redox 1 45 pm
gassing 2 30 .07 amp
Reversed to Oxdy at 2 31 pm
The blue dont stream out on Oxdy now — no blue stream out at all — I suppose this may be due to 1st oxdn making Cop finer at 2 46 pm blue commences stream down

Redcy 10 am .084
Rev Oxdy 2 pm
gassing 3 10 pm .088 amp

6/10/166

7.8	minutes	Oxidg
6.8	"	Reducg
6.0	"	Oxidg
9.4	"	Reducg
6.8		Oxidg
8.2		

39 = a number 10 that had been well reduced at full red — oxidized on plate for 7 hours dull red —

on Reducing 10.10 am —

.084

gassing when returned pm during

Reversed ~~Reducing~~ 2 pm

No blue in 25 minutes —

3 pm no blue — plate dark red

gassing 15% at 3.10 pm —

It looks as if oxidg made plate more porous + swelled it

Reversed to Reducing 3.17 pm —

gassing 425 pm Reversed Oxidg

4.25 pm .102 amp hours —

gassing 20% 5.20 current .08

amp — .08 ampere hour —

No blue has yet appeared in this cell — gas only on Ni holder

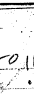
no gas on plate — after gassing a little while plate was clean + when clamp started blackening from dark red + this is extending downward from clamp gradually — a short time between blocks of red no blue yet — to gassing but probably too hydrogen

over

Each No 10 Reduced by H. rod
weighs .34 grms. —

Efficiency CuO — .29 amp hour
" Cu_2O — 14.5 "

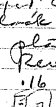
39 Coating 1/8 inch the block got down and as lower deposit



.017 did not stop gassing 9
reversed to Reduce at 6.53 pm —
gassing ~~at~~ 8.27 pm gas
Cross 1 pm wiped off plate.
Reversed ~~P.M. 0.6.9~~ 8.27 pm .08
gassing 10% 9.35 10% ~~and H~~
Reversed Reduce 9.37 pm —
No blue as far
10 pm Raised Current to .10
gassing 10.50 pm Reversed Ox 10.52 pm
.113 amp hour
No blue gassing 11.37 555
Reversed to Reduce 11.37 —
gassing 12.30 — Reversed Oxdy —
Cutoff 12.40 am

40 No 10 same as 39 —
dipped in AgCyKcy —
apparently only surface attacked
on Oxdy 10.32 am .085 —
Blue drops down just the same —
gassing quite strong [Black Reversed] 2.15 pm
to Reduce
little blue streamed down at
first then stopped. Oxide ag that
made plate black reduced to
metallic. Silver plate now bright
gassing 4.20 Reversed to Oxdy
.16 amp hour

Silver Scale



Cutoff 12.40 am

at 5 pm blue streamer
appears
gassing 6.50 pm Rev Reduce 6.50
.20 amp hour
gassing 9.05 ~~Reversed Oxdy~~ 9.05
.20
10 pm Raised Current to .10 JMA

Gassing 1116 pm .19 amp hour
Reversed to Redeg 1117 pm
Current off 1240 am
" on 850 am
gassing 856 am - Reversed to
Oxdg at 9 am.
gassing 1020 Reversed Redeg
at 1025 am - 15.2 amp hour
gas full 1148 am - Reversed
Oxdg - 1149 am -
Current off 1211 pm
on - 1 pm

On Redeg 950 .10
Oxdg 1130 .10.

Current off 1240 am
" on 850 am
41 - Reg No 10 plate
20% Sal KOH on Oxdg
210 pm / .08
237 pm slight blue streaming down
plate turns bloodish white 39 turns
blood red - gassing 425 Rev Redeg -
425 .18 amp hour -
gassing 640 .18 of amp hour
Reversed Oxdg 640 pm -
gas all over plate -
Gas bubbles on this plate, Oxdg that
reversed and continued to get black
near clamp & extend down but
there came a blush up stuff
way down the plate & there was
a green precip on surface of
plate - the plate after a ~~[illegible]~~
few minutes started gassing
Slightly - this plate is peculiar in
color light & dark & has of -
more scarlet appearance than
others - 9 Red to Redeg 8 40 pm
108 10 pm reversed Current to .10
The black at top a green on part plate gone
at 1033 - gassing 1036 Reversed Oxdg .10
gassing 12 midnight - Reversed Redeg
12 midnight -
over

gassing 930 Reversed to Oxdg
930 pm 13.5 amp hour
gassing 1058 am .15 amp h
Reversed 1054 am
Current off 1211 pm
" on 1 pm .12 amp hour
gassing 1 pm
Reversed Oxdg
No blue ~~gas~~ ~~clear~~ getting
a little colored
gassing 220 - Reversed Redog
2 20 pm .13.3 amp h
notice part of plate black after
Oxdg

1.17

gassing 335 Reversed Oxdg 335
c .10 gassing 450 .125 amp h
1 Reversed Redg 450 .125 amp h.
1100 gassing 610 - Rev Oxdg 610 .10
.12 amp
Current off 630 on 710
gas 8 pm .115 amp h Reversed Red.
8 pm Current off 830 on 940
on Redg 950 amp

42 - Is a No 10 oxidized in plate
7 hours then put in H Cube
Reduced & then put Oxdg at
2.38 pm - 085
plates light Canary color -
3 pm dark " " No blue
3.10 pm blue appears
at 320 put some Vanadate Soda
in Solution about 5 grms
Reding full - 405 pm Cop block -
~~Reversed to Oxdg 405 pm~~
at 452 Blue appears down
gassing 642 - Reversed Redog
642 pm
gassing 843 Reversed to Oxdg
844 pm
10 pm Reversed Current to .10
Considerable blue was down
Current off 1240 am
" on 850 am
Current

1.99

.12

Y3 No. 10 Soft pressure —
on oxdg at 327 pm 8
.058
Blue = plate Black
gassing 5 pm bubbles gas
Coming off of whole of plates
Reversed Reducing 5.05 pm —
gassing .735 strong — Reversed
Oxdg .745 pm
815 Blue streaks streaming down
gassing 917 pm — Reversed
To Reduce 917 pm .108 .12 amp
10 pm raised current to .10
gassing 1050 Reversed Oxdg 1055
Current off 1240 am
" on 850 am
on Reducing 950 am
Oxdg 1130 .10

44 = No 10 Hand gassed
Oxdg 330 pm 1068
Blue - plate yellow -
gassing slightly at 6 o'clock
:20 pm hour -
plate gassing yellow - plate,
black - Reversed Redog 6 pm
gassing at 820 1815
Reversed Redog 820 pm -
~~925 Blue clearing down~~
922 Rev Oxdg - 16 blue clearing
down 925
10 pm Raised Current to 110
gassing 11 pm Reversed to Redog 11 pm
Current off 1240 am
" on 850 am
Ng

45 is a No 10 - Hard pressed
2nd run or lot - Ready by H in
tube = The oxdg in dish over
flame — Radey at 7 pm
.08 amp —
10 pm reversed Current on .10 } 2.05 amp hours
10.17 pm just finished going
Reversed to Oxdg at 10.16 pm .10
Practice white sheetings going
down plate at 6 Volts. Got no
blue in them — going 5% at
11.43 pm 1 Hour 26 minutes
.14 amp hours
Theoretical Cu_2O .17.1
Reversed Oxdg 11.45 pm — .10 —
Current off 12.40 am
" on 8.50 am
going 9.03 am Reversed Oxdg
9.05 am .10 1 hour 7 minutes
.11 amp hours
specs all over plate going
10.20 am - blue sheetings
this is Good & Curious as
the others don't give it —
its probably not all oxdg
on flame
OWH

2.05

1 | 100
6 min to a 1/10

Wt of hand pressed plate
.41 grams
Theoretical for CuO .34.2%
Cu_2O 17-1%

gassing 10 — .11 amp hours
Reversed 1130 am — .10
The sample — shows no blue
& appears bright
Current off 1211 pm
" on 1 pm
gassing 125 — Reversed Redcy
.25 pm. .11 amph
gassing 250 pm Reversed Oxdg
252 pm
gassing 432 Revsd Red 432 — .10
.16.6 amphrs
gassing 6 pm Rvsd Ox = .15 amph —
Current off 6.30 pm
on 710
gassing 745 pm — .11 amphr
Reversed Redcy 745
C off 830 on 940
gassing 955 — .10 amph
Revsd 955 pm Oxdg
slight tint — on Redcy 950
Oxdg 1130 .10

gassing 1235 pm — Turned off

46 — 1010 2nd run Soft pressed
+ oxdzd by flame — on Reducing
at 8 pm —
10 pm Raised Current to .10
gassing 1010 pm Reversed Oxdg
1010 pm .10 — 2 hours 10 minutes
about .17 amp hours, this is poor
no blue appearance —
gassing 1115 .10 amp hour
Reversed Redcy 1115 pm — No blue
gassing 12 midnight Rev 1203 AM
Current off 1240 am
" on 850 "
gassing 850 — Reversed Oxdg
858 am. gassing 933 pm 40 minutes
060 amp hour
gas 1010 — Reversed Fe Redcy
gassing 053 am 37 minutes
Reversed Oxdg 1055 am
Current off 1211 pm
on 1 pm

8

.115
10
5
1.6
28.1

60
25

60
25
87

50.

1.20

.110
4
22

1.386 | .45 / 7.5 / 21

1.66

11-17

100
25
125

.10 / 13.3

47 - No 10 2nd Run Hard pressed
then Oxdzd flame in K & H 20%
on Reduced, 8 35 pm -
10 pm reduced current to .10
at 1105 has gone .21 amp hour
gassing 1150 28.5 amp hour
this is good it showed go
14.25 as Cu_2O -
Current off 1240 am
" on 850 "
gassing 920 Reduced to Redg 920
.10 .13.66 amp hour
gassing 1037 .13
amp hour
Reduced to Oxdz it 1040 am.
No blue Electrode bright (1) N.
Current off 12 11 pm
on 1 pm
gassing 1.10 pm - Reduced Redg - 1.6.6
amp hour N a little darker
gassing 306 - about .20 amp hour
Reduced Oxdg 307 pm
gassing 5 pm Reduced Redg 5 pm .10
.19 amp hour
Current off 630 on 7.10 pm
740 gassing .20 amp hour
Reduced Oxdz 740 - .10

Cuff 830 on 940
1 hour 30m to 1020 pm

gassing 1045 .19 amp H –
Reverse Redcg 1045
Hydrochloric blue test
On Redcg 950
Oxdg 1130 – .16 amp/H
gassing 205 – Rev Redcg 206 pm
Unpaired to new H2SO4 Solution
other finished =
Revsd Oxdg 354 pm – .10
" Redcg 558 .19 amp H

133
100
23

50
12

2

7

20
10
1

10

46 – Hard pressed No 10
Oxidized long time in flame
then dipped in strong
acetate Copper + then
again Oxdg by flame
for Reducing 1120 pm
.10 –
Current off 1240 am .2 amp/H
" on 850 am
1 gas 10 10 am Reversed Oxdg
1015 am .10 moolight till 10 pm
gassing 1124 pm – Reversed
Reducing – 1125 am
.115 amp hours
Current off 1211 pm
on 1 pm

gassing 120 pm – .10 .110 amp H
Reversed Red 125 pm .10
gassing 250 pm .13 amp H
Reversed Oxdg –
gassing 355 – .102 amp H
gassing 450 pm Revsd Redcg 555 pm
gassing 556 – Revsd Oxdg 556 .10
Current off 630 on 710
gassing 750 Rev Redcg .125 amp H
~~gassing 830 Oxdg~~ – cuff 830 on 940

going 10 25 Rev Ox 10 27 pm —
~~Redox~~
Blue streamers at 11 45 pm —
On Redog 9 50 Oxdg 11 30
going 12 7 pm — Taken off —

Remark KOH seems to stop blue more than NaOH.

Mem — I notice many of the plates gas strongly for 1/2 min after current off — think it due to Reduced Zinc made plate — also notice it often Oxdg but only 1/2 as strong

1039 Continued
Current on 850 am — .10
going 10 10 Reversed Redog 10 17 pm
.10
going 11 15 slight
Electrode little discolored on Redog
showing slight tap gas into solution — also on Redog plate very dark — going freely at
11 26 Reversed Oxdg — 11 27 am .10
Current off 12 11 pm
on 1 pm
going 110 pm Rev to Redog 54 mins
gas 210 — .10 amps — 60 ins
Reversed Oxdg 212 pm

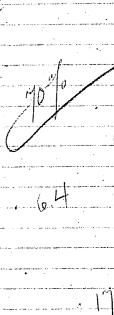
Gas 310 pm Reversed Redog 310
going 410 pm Reversed Oxdg 410
going 516 — .11 amp hour
Reversed Redog 517 pm .10
gas 622 pm .10 amp hour
Reversed Oxdg 626 pm —
Current off 630 on 710
going 830 Rev ~~Oxdg~~ Redog
Coff 830 on 940
going 1055 Rev Ox 1055
6.23 amp hr

34 has a decided blue tint
on Redeg 950

Oxdg 1130

49 Cop by Induct alcohalized -
then sluvered by AgCyKCy -
washed alcohalized - then hand
pressed. Reduced by low red heat.
Nat oxdgd - on | Oxdgd 955 am
.10 -
Blue steamers go down
9 am growing 905 stopped
growing - 906 started growing
again -
Current off 1211 pm
on 1 pm

50 - Same as 49 but without selvin
on 0.09 9.55 am .10
gravy 9.25 -
Evidently these finely divided
Copper dont let enough solution in
to work they are fine but not
porous enough - Only way
would be to reduced at
lowest temp possible -
Cumulative 12.11 pm
on 1 pm



51 Same as 49 but not reduced
by th, but was oxdzd by
flame on Reduced 11 07 am
.10 not oxdzd in Centre
Current off 12 11 pm
on 1 pm
X gassing 2 58 pm – Reduced Oxdzd
2 58 pm .10 .30 amp hour

gassing 4 10 pm 72 minutes .12 amp
Reversed 4 15 pm to Reduced
X gas 5 30 Reversed Oxdzd 5 30
Current off 6 30 on 7 10
gassing 7 20 .115 Amp
Reversed to Reduced 7 22 pm
X gassing 8 25 – Rev Oxdzd 8 25
C off 8 30 on 9 40
gassing 10 45 .115
Reversed R 10 45
No test on Reduced 9 50
X Oxdzd 11 30
gassing 11 26 pm Rev Reduced 12 7 pm
.11 amp current
~~Notes~~ No test on 10 Cap time but 9
finally left in in hour oxdzd
this very fine element of Edison
go dismantling probably a piece Cap in

Slight blue tint -

63

86

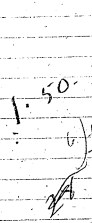
63
120
20
3
20
180
23

3.333

1.26

60) 23 . 10

52 - same as 49 but not
colored - but oxdg flame
on Redcg 11 08 Vacu —
not only in center
Current off 12 11 pm
on 1 pm
gasing 320 pm Reversed Oxdg
X 320 - .10 — .333 amp H 55
gasing 442 Reversed Redg
442 pm — .133 amp h -
X gasing 607 pm Reversed Ox
607 pm - .14 amp H -
Current off 630 on 710
gas 825 Rev 830 Redcg
Current off 830 -
on 940
X gasing 1055 pm Rev Ox 1055 .10
.125 amp H
not tint
on Redcg 930
X Oxdg 1130
gasing 130 .11 amp how
Reversed Redcg 130 pm
Oxdg 1047 .10
no Chic ~~tint~~ 50 fol
gasing 842 - Rev Ox 843



53- Hand pressed No 10. Redby H
then Oxdzd 7 hours. then put
in Saturated LiOH —
on Redcy 137 pm .10 —
gassing 420 Rev'd to Oxdzd 420
.10
Notice plate beautifully reduced
Even straight Copper color —
Notice all Oxdtn blacks grows black
as if it was going to CuO dually —
plate finally turn greenish
yellow + very pretty —
gassing 6 pm .166 amp H
Reversed Redcy 602 pm — .10 —
Current off 630 on 710
gassing 720 Rev Oxd 830 —
1 C of 830 on 940
gassing 1130 Reversed Redcy 1830 amp
on Redcy 950

Oxdzd 1130
gassing .14 | Rev Redcy 147 .10
Oxidized Blue tint

54 = Old X010 not hard pad or
reduced but only on flame
pictures in grid Unit O clamps &
clear mirrors on Reducing 425 pm
.10 —
Current off 630 on 710
C off at 830 on 940
Upper ch grounding 1105 pm
Rec Off Ch 1105 pm —
on Ch chg 958

Off chg 1130

55 = ~~[illegible]~~ old X010 method Oxflow
(9 Minute) - soaked twice in
strong acetate Nickel &
heated red each time
got no time when put on
to reducing am going to
let it overreduce as Nickel
will be since its 62 reduced -
going 10% at 540 pm
Reversed Oxdy at 550 pm .10
after Current off 1 min 1/2 minute
heavy - growing Cons. [illegible]
when put Current on Oxdy then
it went down to a little at —
20 sec Came out in green
Volumme for 5 seconds then
plate clean = Over Reducing
Blackened plate Dark red —
Current off 630 ON 710
1 hour to 730 pm - .12 amt
going 748 pm Rev Reducing 749 pm .10
Current off 830
ON 940
going 12 amp on Oxdy
1016 pm -
No time - 1130 Blue streaks
at Reducing 950 ON

.12
-10
35
-5
1
40
39

Oxdg 1130

gaaing 120 - Rev Redeg 120

56 = Hydroch of Hydroxd Ammon

Zn Oxd - 2 Nitg Pals -

x010 Hpm Ammon Nat Flame

oxdgd on Oxdg Cu plate

755 Hpm .10 -

Current off 830

on 940

Mg

56 – 25% Sal Chl Zinc – Zinc Hy
plate – / 1810 Reduced not
oxidized by flame – on oxidy
at 1100 pm.

57 = Made from H010 cliff.
1/5 Gulch Benzene area
on Redwy 01.010 pm —
No Cut —
on Redwy 9.10

Oxdy 1130
gravity 10% 1.18 pm —
Revised Redwy 1.19 pm
Oxdy —
On Redwy 510 — .10 —
Oxdy 1079 — .10
No Cut —

58 old No. 10 stuff 1/5 Gulch
Carb ammonia on Redseg
1012 pm —
on Redseg 958

Night blasted
Ordzy 1130
growing 1-24 pm Aprod Redseg 124
noticed yesterday before pulling on
Current slight blue Halo around
bottom of the plate —

59- Lochl Hand press Rolled 1810
1205 oddy

60 : Indicator Old No 10 Hand pad Rotated
Ready 12.05 AM 40
on Reading 95-0

51 — Incident Silver / flame ox
56 — Cast Am
52 — Same as 51 not silver
57 — Benzoic
54 — Change elim nerves

not tested

Prep R by H. m. Hills —

61 — No. 10 — Hot pressed, then OxO_2 by flame — then cooked 6 times in acetic acid — on 1 gm .10
Redcy 2 Hours 10 minutes .10
.20 am hours —
I let it go for several minutes to reduce the Nickel —
Reversed OxO_2 320 gm .10
on Redcy 5.95 — better glazing
1/2 hour cubic 1 reversed to Redcy

No. 62

Remarks 88% efficy —
notice when it gased didn't gas
on plate out of holder

Notice on Reversed Reducing
stuff flew off the plate electrodes

plate didn't gas when Oxdg

7

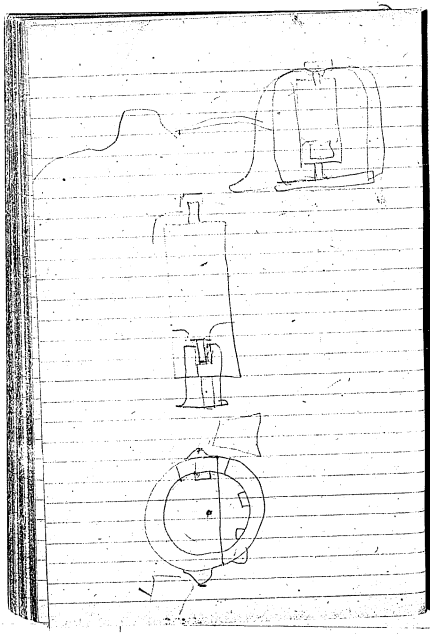
60 .15 57
36 .10
4 .4 1

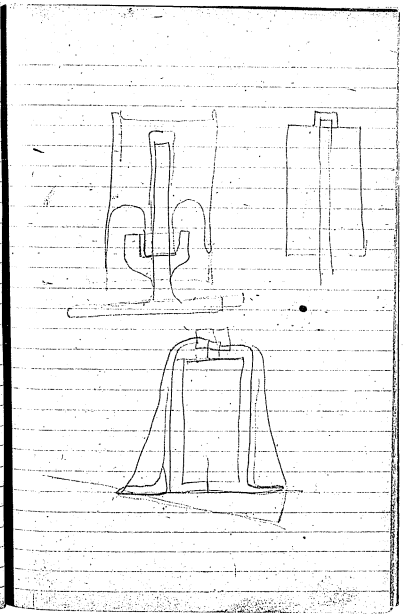
62 — June Cop (Zn dust) pressed
hard 55 grms Oxide .44 metal.
Copper — Oxdg flame — on
Reducing 5.27 pm —
gassing at 1.950 Rev Ox 9.52 .10
gassing 11.05 .16 amp per hour
Reversed Reducing 11.10 pm .10
gassing 12.30 Rev'd Ox 13.3 .2 amp ft
no dendrite
gassing 9 am flow to Redcg 9 12.5 amp/ft
Rev'd Redcg 11.40 AM —
gassing 1.40 .12 amp —
Reversed 1.40 pm .10 —
on Oxdg 6 pm —

plate good when reduced

$\frac{3}{2}$ / $\frac{3}{6}$

63 - fine Copper (Zinc-wet) hard pad
33% Cond Nitrg ⊠ weight one
Oxide .33 - .264 metallic
Cond Nitrg bet 40 & 60 mach
OK Reducing 5.34 pm
Old fine
gassing 1012 Rev'd OK 1013
gas 1110 - .095
Rev'd Redg 1115 .10
gassing 12 Midnight Reversed
to Oxdg -
nodule bent - gassing 815 Rev'd
820 gassing 901 am - Rev'd
to OK at 901 .066 Nitric
130 pm Chief Chemist Coming
down Very strong Oxdg -
It's probably Old Ammonia





Shunted gas 839 pm 100%
Cu O
shunted gas 44 pm

Phenom — on Reducing 64
It was 3/4 Reduced & gave
bright Copper-Color down to
the Clock — Took Current
off for 3/4 hour Came
Back & doubled Current to
produce balance —
This part of the plate
the Cop is covered
Shades darker
What is it?
probably a local Elec action
but the Cop is oxide —

64 Fine Cop (Zwdust) - Hard gas
50% Carb Nitr wt as oxide
.22 .176 Metallic C —
Oxdg flame
on Reducing 537 pm .10
Off 634
Reduced 755 — on Oxdg 756 pm .10
Shunted gas @ 0735
∴ Reduced to Oxdg 1905 pm .10
gasg 935 — 68% effect as 20
Flat it got till 947 — no black
spot at blowpipe flame
Reducing at 948 .10
gasing 1014 — Reduced OK 1015
gasg 1034 Rotten
no flux but.

65

Remarks

Notice plate getting black started at the bottom which was last reduced - to gradually creeping up other part Crimson

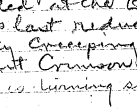
Latter block is turning slightly yellow -

I looks as if there was

Cu_4O Cu_3O_2 Cu_2O

Crimson Black yellow -

When it started growing it did it exceedingly small -



After growing 1 minute 2@4%

a black spot next to clamp started this is prob CuO -

65 - fine Copp (Zinc red) (Mad red)

Ord of Cane - KOH 20%

on Reducing 625 pm 110 -

on 720 pm -

growing 1035 Rev Oxdg

1037 110

growing 1054 - 13 amp/hour

good fine 12% -

growing 15% - Reversed Co

Redog 12 midnight

Phenom - on Revsg not gas came out Electrodes burnt

(10) Cu plate had not gassed - no blue tint - on 3% nickles up to 1752 this morning

growing 838 Rev Oxdg

838 1 .14 amp/hour

on or at 11 30 pm -

Coff 1212 on 106

I have been Oxdg this for several hours so black is within 3/16 of bottom - I now reverse Redog 945 pm -

Obserd Lake 236

66 = [illegible] (Zn) plated —
not [illegible] 1 Cor at 1811 —
Stm 1 hour dull red-oxdg —
On Redeg at 155 pm '10
Weight plat'd oxide .602 —
On Oxdg 6 pm '10
growing 725, Reduced Redeg 727 pm '10
growing 854 Rev Oxdg
855 pm —
growing 1012 Rev Redeg 1014

This is low efficiency

67 - No 11 Stuff
On ~~oxide~~ Reducing 157 pm .10
Bright red heat ~~two~~ hours oxdg
.161 grams as Oxide
On oxdg 6 pm .10
gassing 722 13.3 amph
Revised Reducing 724 .10
gassing 8 49 pm Rev Oxdg
8 52 pm .15 amperes
gassing 1012 13.3 amperes
Revised Reducing 1013 pm

3.53

113.84
4.13

62
80
496

496
432
64
1984
2083

41
43
123
164
1763

11
44
44
1684

41
43
123
164
1763

68 : 11 Stuff - Oxdgd Very bright
Red 3 Hours, At Redeg 4.37 pm
Weight '67 as Oxide
Losing 826 Reversed 830
10 Losing 10 o'clock
.13 Amp hour -
Reversed Redeg 10.01 pm - .10

6.9 ~ Silver by Zinc ~ Ox Aq 432 ppm ~

Zinc plating NaOH - NaOHZn
strict neutral Aluminate Soda
on plating 445 pm —

70 - 8011 Stuff - Oxydized 1st bat
1 hour then soaked in Stuff
KOH 3 min then reboiled
25 min Rev Oxy on Reding 5 36 pm
8 52 pm Rev Oxdy
8 53 pm 1.01
1015 Rev 1015
1.35 amp H
on Reding gave 1.35

43-

9

.107
.15-
.22

8 hr

71 No 11 Stiff oxdy flame
then dipped off top 0.72
oxdy low red for 1 minute
6 odd times' on Redy 1147
weight .54 oxdy
up to daylight 43 minutes .10
to 8 am. : 7 h 30 min .102
gassing 846 am —

if using only on shaded part

~~The~~ let it run till good all ~~on~~ on oxdy 855 am
71 grams | 10.10 | 12.5
Amp Hour. | Theoretical .18
67% Effey —
Revised Redy 1026
Oxdy 11 | am
with | .3 Current notice
blue streamers after
started gassing
very slight causticity
on chfm —

In proper light
Chl Cop is best!

Evidently something
in soaking oxide plates
in Concentrated
Nitrate Copper —
as it scarcely blues
solution in 2 hours
Oxdy while Chl Cu
is quite blue & acetate
is dense blue —
Acetate plate gases all
over while Chl &
Nit Cu dont only
in blue —
In a different light chl & nit
about same, Cu still hurt
acetate dense blue

72 No 11 stuff Same as 71
except dipped in Nitrate
Copper & the oxide flames
on Friday 11 47 pm
Cot - 160 oxide
gassing 9 am —
not yet over I let it gas till
its all over —
Reversed Oxdy 9.10 am
gassing 10 37 —
of the 3 cells with plates
dipped in Acetate Cu
Chl Cu + Nitrate Cu
+ Ox with high current
density. The Acetate Cu
tint solution very blue —
Chloride just a tint +
Nitrate Cu just see tint
although some blue came
out at time for 1/2 minute
absorbtion on OX the
acetate plate gases all
over Chl work + Nit
partially non-electrode

when Cud is being formed

Notice part written clamp
not redhead bright like
Galanci - also it dont gas

73 No 11 stuff same as 71
Got dipped in acetate Cop
+ Reoxed on Redeq
1147 pm -
wt .57 Orell
gassing 951 am. not gassing
uptown, - left it on tree, it
gassed del over - On oxdg 855 AM
gassing 1015 am - .133 amp
Vertical .19 - 70% effic

Revsd Redeq 1020 am
with .3 current notice
Blue alcoamous -
∴ Before alcohol gassing
But very slight alcohol
Can actually see them

31st Aug 1900 JAE

Mem=

Results of Experiments so far show that hydrate of Cu is not formed if the Copper is very finely divided

2nd that NaOH is better in respect to Blue hydrate formation than KOH –

3rd That a long continued oxidation of even finely divided Cu plates will produce some hydrate soluble in the alkali –

4th That Blue hydrate sinks at therefore if long oxidation is to be performed in Combe practice the Cu plate should be put in a pocket only open at top –

5 That the Cu plate should be oxidized before putting in Coating & then reduced by Quinol

6= Oxidation by heat – dull red will do for 1 hour but higher heat makes plates less trouble after being in bath long time – gives no better results

7 so far average efficiency of Cu oxide to Cu_2O 60 per cent, 75% should be limit for safety

8 = Soaking in Cu Salts dont better them

All Experiments Recorded in the Book made last Aug 22 1900.

& 31 Aug 1900 JAE

65 150

2

130

35

5240
30
30

2 HP hours

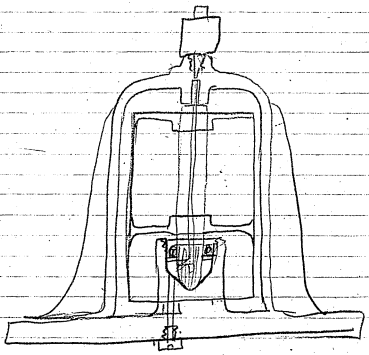
6)350
5

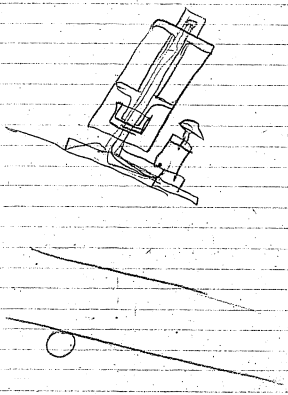
5240
30
157200
18
1257600
157200
2829600
1980000) 2829600
1980000
849600
792

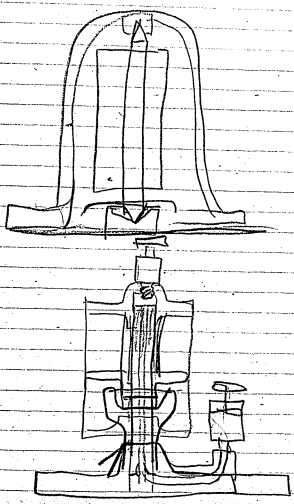
(14

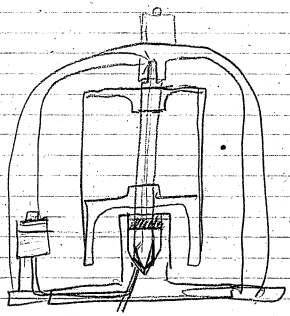
33000
60
1980000

1980000









1600 [illegible]
2800 [illegible]
2600 tons
x 53
3463

Oxford Ore

Iron	52.00	55.00
Phos		.10 & below
Sulphur		.10
Silica		15.00

5 1/4 miles Oxford

64 × 4 = 448
75
373

64) 373 (5.82
320
530
512
18

610
390
150
40
20
1210

552
390
150
40
20
1120

5.82
95
290
291
5.523
5.529

373
45
4184
384
340
320
20

64) 653 (5.52

6.53
95
3265
5877
61035

.90

5.52

60
95
155

5.82
95
291
5238
5529

64
7
448
75
373
32
532
51

5.82

5.82

250 Pd @ 25 Pd
250 C

64
448
75
373
7
366
300
159

1096
24
4392
2196
26352

26.000

Friddy bots 21 brat.
& " 20 "

Formate
Oxalate
Nitrate
Formate
Sulphate
Chloride
Carbonate
Cyanide
Iodide
Bromide